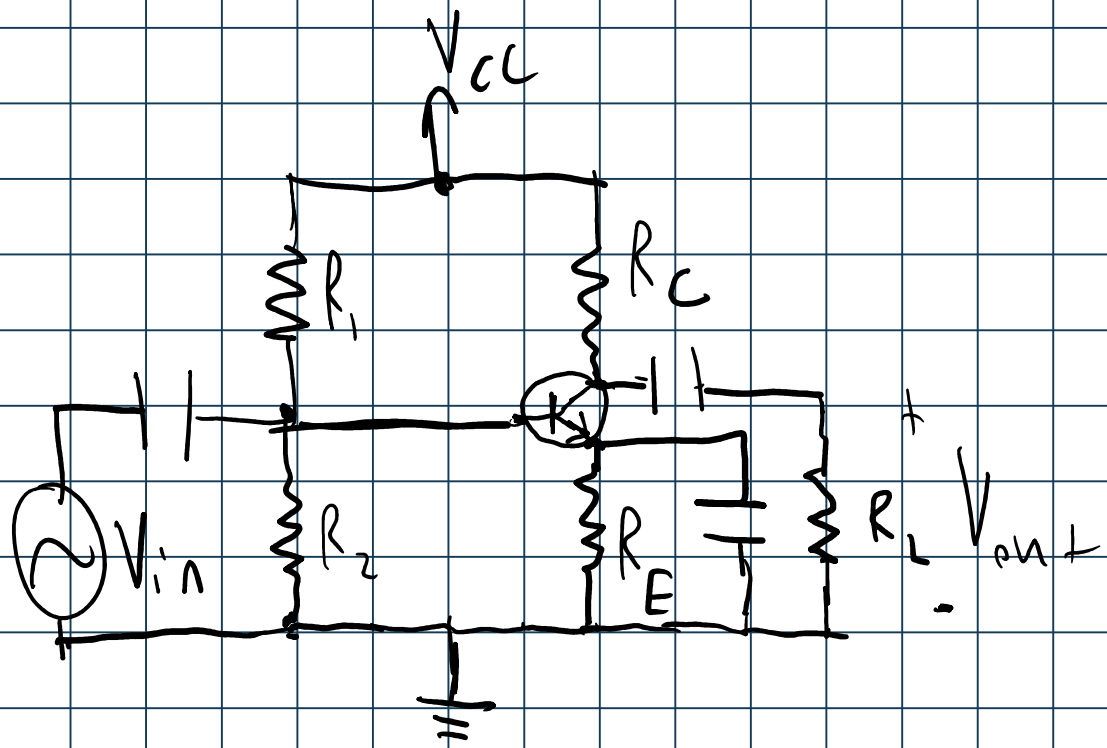
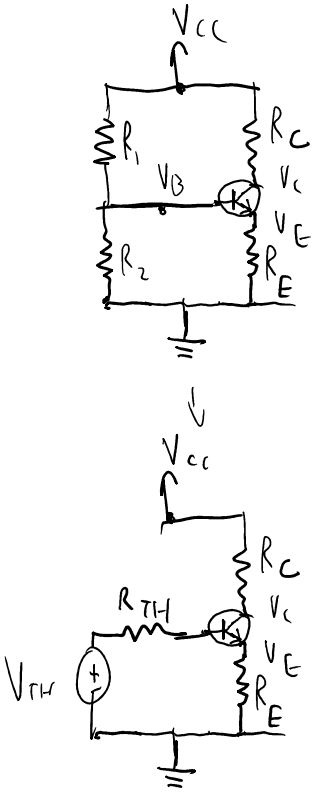
Schematic

Friday, April 28, 2023 12:54 PM



DC Analysis

Friday, April 28, 2023 1:00 PM



$$V_{TH} = V_{cc}\frac{R_2}{R_1+R_2} = 6.11V$$

$$R_{TH} = R_1 \| R_2 \approx 21k$$

NOTE! Hand calc uses diode voltage drop = 0.7
multisim uses 0.75 (from PSPICE model)

$$V_{TH} = I_B R_{TH} + V_{BE} + (\beta+1) I_B R_E$$

$$V_{TH} = I_B (R_{TH} + R_E(\beta+1)) + V_{BE}$$

$$I_B = \frac{V_{TH}-V_{BE}}{R_{TH}+R_E(\beta+1)} = \boxed{186\,\mu A}\ I_B$$

$$I_C = \beta I_B = \boxed{29.1\,mA}\ I_C$$

$$I_E = (\beta+1) I_B = \boxed{29.3\,mA}\ I_E$$

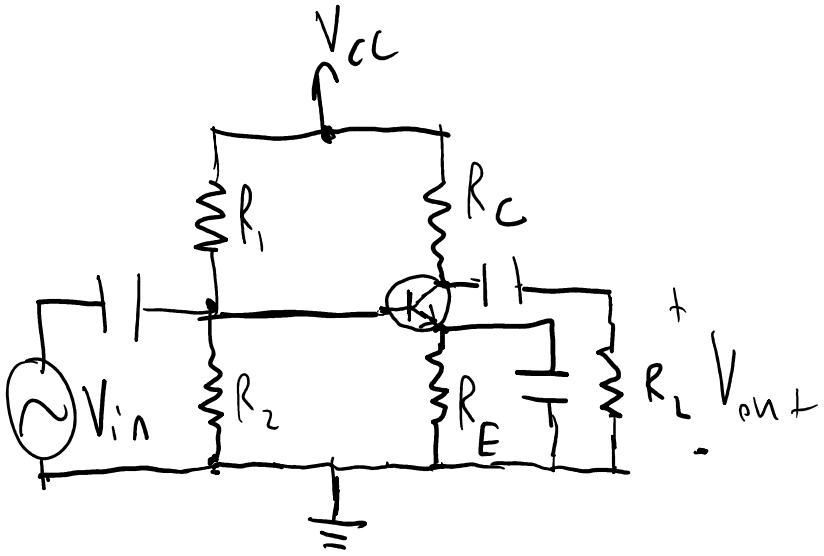
$$V_B = V_{TH} - I_B R_{TH} = \boxed{2.214\,V}\ V_B$$

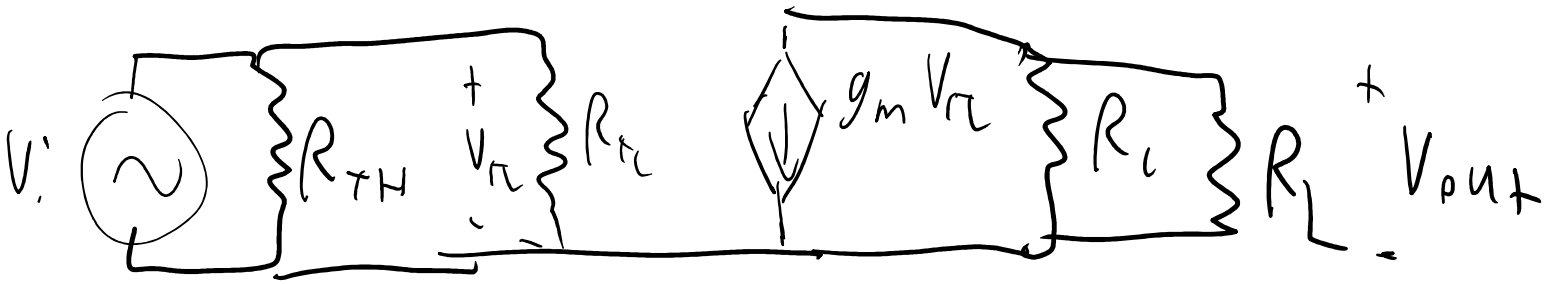
$$V_E = V_B - 0.7 = \boxed{1.514\,V}\ V_E$$

$$V_C = V_{cc} - I_C R_C = \boxed{6.047\,V}\ V_C$$

AC Analysis

Friday, April 28, 2023 1:54 PM





$$g_m = \frac{I_C}{2 g_m r}$$

$$V_{out} = -g_m V_{in} \cdot R_c \| R_L$$

$$r_\pi = \frac{\beta}{g_m}$$

$$\frac{V_{out}}{V_{in}} = A_V = -282.76$$

$$r_{in} = R_{TH} \| R_{\pi} = \boxed{175.017\,\Omega}$$ r_{in}

$$r_{out} = R_C \| R_L = \boxed{318.35\,\Omega}$$